

Materials of Conferences

**AN IMPACT OF KEABY METALS OVER
AN INTENCITY OF PROCESSES
OF POL AND ACTIVITY OF ANTI-OXIDANT
SYSTEM OF UNDERYEARLING
CARP BLOOD SYSTEM**

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An impact of cadmium, lead, and marganese over an intensity of free-radical processes in underyearling carp blood processes has been studied. An activation of processes of peroxide oxidation of lipids, oppression of catalase, and also oxidation of general anti-oxidant activity under chronic (40 days) impact of cadmium, lead, and margagnese salts has been investigated. The received data testify for a shift in oxidation-anti-oxidant balance in blood of card underyearlings in terms of chronic toxicant impact.

Different natural and anthropogenic factors can have a significant impact over correlation in processes of peroxide oxidation of lipids and anti-oxidant activity among freshwater hydrobionts [9]. Activation of peroxide lipid oxidation is observed under an impact of the most different extreme agents (including such widespread toxicants, as heavy metals) and provides for a mobilization in protective forces of an organism, including mechanisms of anti-oxidant protection. In this case our in-

terest is drawn to defining correlations of POL and GAA in blood of hydrobions under a chronic impact of heavy metal ions.

Methods and materials. The work has been carried out on a basis of laboratory of anatomy, physiology, histology of Dagestan state university. Card underyearlings (*Cyprinus carpio* L.) of mass of 100–150 g were used in the experiment. They were grown in pods of Shirokolskiy piscicultural complex of Republic Dagestan. The fish was carried to aquariums of volume of 250–300 litres with contents of lead acetate 0,5.

Fish were transferred to aquariums 250–300 liters of lead content matsetata 0,5 mg/dm³ (MPC 0,1 mg/dm³), cadmium chloride 0,25 mg/dm³ (MPC 0,005 mg/dm³), and marganese sulphate 0,1 mg/dm³ (MPC 0,01 mg/dm³). The fish that was contained in fresh water served as a control. Conditions of constant temperature (19–23°C) and gas regime were created. The fish was fed with alive sludge worm *Tubifex-tubifex*. At different periods of fish exposition in water environment with heavy metal ions (days of experiment 5, 15, 30, and 40), contents of malonovogodialdegyde (MDA), catalase (CA), and general anti-oxidant activity (GAA) in blood was defined [5].

The received results are proved with variative-static processing via method of small selection [7].

The results of the study are presented in the Fig. 1-3.

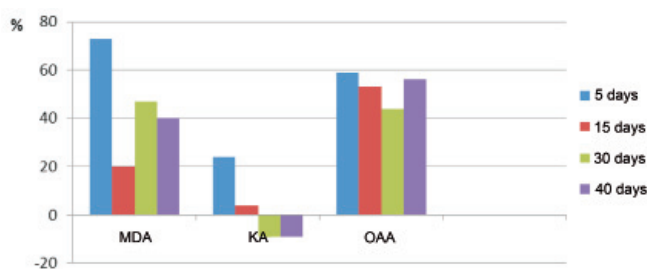


Fig. 1. Dynamics of indicators of oxidation-antioxidant blood carp fingerlings (in% relative to the control) under the influence of Pb²⁺ ions, depending on the duration of intoxication

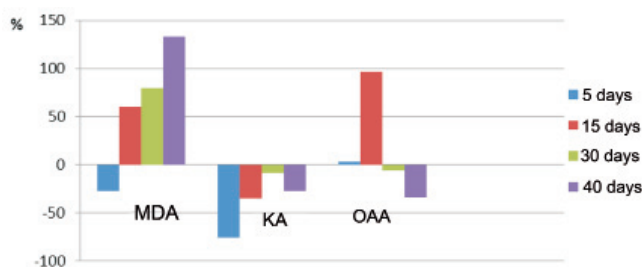


Fig. 2. Dynamics of indicators of oxidation-antioxidant blood carp fingerlings (in% relative to the control) due to Cd²⁺ ions, depending on the duration of intoxication

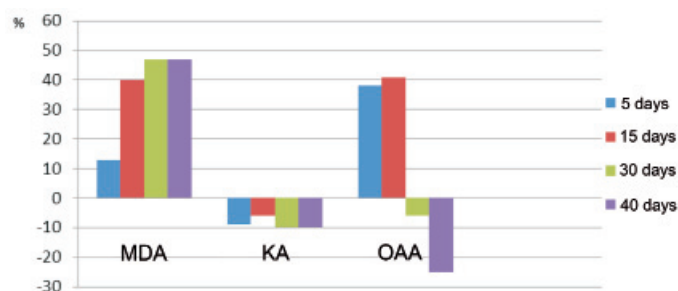


Fig. 3. Dynamics of indicators of oxidation-antioxidant blood carp fingerlings (in% relative to the control) due to Mn^{2+} ions, depending on the duration of intoxication

The intensity of POL under an impact of heavy metals was evaluated according to the contents of MDA in under yearlings blood. During the experiment, an increase in MDA contents was registered under an impact of heavy metal ions. A maximum increase in the indicator was observed during the 5th day of the impact of lead ions (of 73,0%) and during the 30th and 40th day of containing with cadmium ions (of 80,0 and 133,0% correspondingly). A continuous impact of heavy metal ions increased a growing intoxication of POL that is proved by an increase in MDA contents in carp under yearlings' blood (from 60% to 133% under the impact of cadmium ions, and from 13,3% to 46,7% – of manganese ions) (pic 2, 3), while the greatest increase in MDA contents under the impact of lead ions was registered during the 5th day with a further decrease during the 15th, 30th, and 40th day of 28,0; 16,0; and 20,3% correspondingly, in relation to the 5th day (table, Fig. 1).

Enzymatic link of anti-oxidant protection also changes. An increase in catalase activity (of 24,0%) was registered during the early periods of lead ions impact (day 5). Inhibition of ferment activity was registered in other variants of the study. It was mostly expressed during the 5th and the 15th day of the impact of cadmium ions (catalase activity was decreased of 75,6 and 34,7% correspondingly in relation to the control).

The sources of the catalase activity in blood plasm are erythrocytes [8]. The ferment plays a key part in anti-oxidant protection of an organism, and in this case we can conclude an oppression of erythrocytic ferments of anti-oxidant protection under the impact of heavy metals.

Dynamics of MDA contents, general anti-oxidant and catalase activity in blood serum of carp under yearlings under the impact of heavy metal salts ($M \pm m, n = 15$).

Toxicant	Exposition day	MDA, nMole/l	Catalase, mcMoleH ₂ O ₂ /l/minute	GAA, mg %
Lead acetate (0,5 mg/l)	Control	15,03 ± 0,29	0,164 ± 0,003	32,13 ± 0,19
	Day 5	25,80 ± 0,48**	0,204 ± 0,003**	51,30 ± 0,32**
	Day 15	17,86 ± 0,15**	0,170 ± 0,001*	48,74 ± 0,26**
	Day 30	21,80 ± 0,15*	0,150 ± 0,001*	46,23 ± 0,35
	Day 40	20,53 ± 0,43**	0,150 ± 0,001*	49,53 ± 0,88**
Cadmium chloride (0,25 mg/l)	Day 5	11,41 ± 0,48*	0,040 ± 0,003**	33,33 ± 0,32
	Day 15	23,50 ± 0,15**	0,108 ± 0,001**	63,00 ± 0,26**
	Day 30	27,15 ± 0,15**	0,150 ± 0,001*	30,15 ± 0,35
	Day 40	35,30 ± 0,43**	0,120 ± 0,001**	20,50 ± 0,88**
Manganese sulphate (0,1 mg/l)	Day 5	16,70 ± 0,12	0,150 ± 0,002*	43,60 ± 0,18**
	Day 15	20,50 ± 0,11**	0,160 ± 0,001	44,90 ± 0,23**
	Day 30	21,80 ± 0,20**	0,147 ± 0,15**	29,50 ± 0,18
	Day 40	21,81 ± 0,17**	0,147 ± 0,15**	24,10 ± 0,14**

Note. * – $P < 0,02$; ** – $P < 0,001$.

An insufficiency of ferment link of anti-oxidant protection can be defined by an initial oppression of catalase activity and toxic impact of heavy metals, a surplus consumption of anti-oxidant in result

of POL activation, and also a loss of anti-oxidant ferments through biological cell membranes [1, 2].

Thus, in terms of chronic impact of heavy metals, activity of anti-radical protection ferments is

oppressed. It corresponds to bibliographic data that testifies for a decrease in catalase activity under stresses of different aetiology [2, 3, 4, 6].

Accumulation of POL products goes along with an increase in GAA and proves the activation of anti-oxidant protection mechanisms. It is displayed most obviously under an impact of lead ions (GAA stays increased 2 times during the whole experiment). GAA is significantly higher than normal (of 96,9%) during the 15th day of containing fish in water with cadmium ions, and also during the 5th and 15th day of exposition with manganese ions (Fig. 2, 3).

The described alterations in indexes of oxidation-anti-oxidant protection of carp fish can be a result of the direct impact of heavy metals over functional condition of fish organism, and also a response towards stress that is caused by a continuous impact of toxicants. With the received data we can conclude that cadmium possesses the greatest toxicity and has its effect as an imbalance of the system POL-AOZ. The lowest balance of the system POL-AOZ was registered under the impact of lead.

The received data can prove the development of oxidant stress and mobilization of reserve characteristics of fish organisms in terms of intoxication with heavy metal ions.

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The work was submitted to the International Scientific Conference «Fundamental research», Israel (Tel Aviv), 16-23, October, 2012, came to the editorial office 13.09.2012.